International Journal of Trend in Scientific Research and Development (IJTSRD)
Volume 7 Issue 2, March-April 2023 Available Online: www.ijtsrd.com e-ISSN: 2456 – 6470

Pharmaceutico-Analytical Study of Trivanga Bhasma

Dr. Abdul Kareem H

MD, Ph.D. (Ayu) Professor, Department of Rasashastra Evam Bhaishajya Kalpana,
Shree Satya Ayurvedic Medical College & Hospital, Moradabad, Uttar Pradesh, India

ABSTRACT

Trivanga Bhasma is an Ayurvedic formulation of Naga (Lead), Vanga (Tin) and Yashada (Zinc). It is a classical ethical economical medicament, effective in endocrinal disorders, pharmaceutical processing as per text with systematic observation and technological updating is carried out in this work.

The classical combinations of three metals starting with Vanga followed by Naga and Yashada has attributed the name '**Trivanga'** to it. All the three metals produce putrid smell on heating hence are categorized as **Puti lohas** To obtain good quality Trivanga Bhasma 10 **Laghu Putas** with an average **temperature** of 475^0 C – 575^0 C is required. Quantitative analysis of Trivanga Bhasma contains Tin - 28.4%, Lead – 17.72%, and Zinc – 29.23%. The XRD report of Trivanga Bhasma revels that it is complex of three compounds Viz. **SnO_2, PbO, ZnO**.

KEYWORDS: *Naga, Vanga, Yashada, Jarana, Laghu puta, XRD, NPST*

How to cite this paper: Dr. Abdul Kareem H "Pharmaceutico-Analytical Study of Trivanga Bhasma" Published in International Journal of Trend in Scientific Research and Development (ijtsrd), ISSN: 2456-6470, Volume-7 | Issue-2, April 2023, pp.111-116, URL: www.ijtsrd.com/papers/ijtsrd53908.pdf

IJTSRD53908

INTRODUCTION

Historically, Rasa Shastra or **"Vedic Chemistry"** is an offshoot of Ayurveda that developed around the period when Buddha existed, more than 2500 years ago. This science is often referred to as **"alchemy"** and the resultant medications are called **Rasas**, which mainly comprise of metallic ashes called **Bhasmas**. These bhasmas are contained in organo-metallic compounds that work as carriers (yogavahi). They act as catalysts and increase the bioavailability of the herbs to the cell.

The Putapaka Kalpana is one of the thermodynamics based pharmaceutical concept by which a metallic ore or a metal itself can be brought into **Nano** and in electromagnetically charged form, hence its bioavailability will be optimum. Therefore that metalloceutic agent will have an excel to endocrinic metabolic and enzymatic disorders; Trivanga Bhasma is one such preparation.

Trivanga Bhasma is an Ayurvedic formulation of Naga, Vanga and Yashada. It is a classical ethical economical medicament, effective in endocrinal disorders only the pharmaceutical processing as per text with systematic observation and technological updating are needed. Naga, Vanga and Yashada can be independently used in clinical practice but as per **Metallic shift theory** the judicious combination of these three are safer and scientifically more acceptable form with least side effects and enormous, neuroimmunoendocrinal therapeutic benefits.

When drug manufacturing is talked about or when a work is carried with regard to drug designing it has to follow good Rasashastra practice, which will be incomplete if suitable up to date advanced integrated instrumental and technological, analytical standardization work is not under taken. Hence in the present study manufactured drug is taken for its basic standardization, evaluation protocols

MATERIALS & METHODS:

Collection of Material

Major raw material: The major raw materials of the present study are Naga, Vanga and Yashada.

Other raw materials: The other raw materials used for the present study are Tila taila, Takara, Gomutra, Kulattha Qwatha, Kanji, Choornodaka, Ghrita kumari and Parpata.

Yantras: The yantras used were Pithara yantra, Khalva yantra, Gas stove, Pyrometer, Laghu puta pit, Sharavas etc.

Associated yantras: Associated yantras include earthen pot, knife, juice extractor, thread, multani mitti, matchstick, measuring beaker etc.

Method/ Pharmaceutical Study design:
The method of preparation of Trivanga bhasma is as follows-

- Samanya shodhana of Naga, Vanga and Yashada in Tila taila, Takra, Gomutra, Kulattha Qwatha and Kanji[1].
- Vishesha shodhana of Naga[2], Vanga[3] and Yashada[4] in Choornodaka.
- Trivanga jarana with Apamarga panchanga churana.
- Trivanga marana: Jarita Trivanga bhavana with Ghrita kumari swarasa and Parpata Qwatha, later subjected to Laghu puta[5].

OBSREVATION AND RESULTS

Pharmaceutical Results:

Table No.01 Showing Results of Samanya and Vishesha Shodhana of Trivanga.

Name of the Metal	Net weight	After Samanya Shodhana	After Vishesha shodhana
NAGA	1000 gms	910 gms	880 gms
VANGA	1000 gms	903 gms	888 gms
YASHADA	1000 gms	900 gms	873 gms

Table No.02 Showing Results of Jarita Trivanga.

JARITA TRIVANGA	Before Jarana	After Jarana
	750 gms	725 gms

Table No.03 Showing Results of Consecutive Putas

No. of Putas	Before Puta	After Puta	Net Loss
I PUTA	675 gms	640 gms	35 gms
II PUTA	630 gms	600 gms	30 gms
III PUTA	590 gms	550 gms	40 gms
IV PUTA	540 gms	520 gms	20 gms
V PUTA	510 gms	480 gms	30 gms
VI PUTA	470 gms	420 gms	50 gms
VII PUTA	410 gms	395 gms	15 gms
VIII PUTA	385 gms	371 gms	14 gms
IX PUTA	361 gms	340 gms	21 gms
X PUTA	330 gms	306 gms	24 gms

Table No.04 Classical tests for Trivanga bhasma

Tests	Results
Varitaratva	Positive
Rekha poorna	Positive
Unnama	Positive
Apunarbhava	Positive
Niruttha	Positive

Table No.05 Showing Results of Qualitative and Quantitative analysis of Trivanga Bhasma

TESTS	RESULTS	PROTOCOL
Organoleptic characters:		PSAF
Colour	Pale Yellow	”
Smell	Odorless	”
Touch	Fine	”
Total Ash, w/w	99.25%	”
Acid insoluble ash, w/w	38.72%	”
Loss on ignition, w/w	0.75%	”
pH	10.10	”
Stannous Oxide	28.4%	A – 2065
Lead, as Pb	17.72%	AA – 7
Zinc, as Zn	29.23%	AA – 13
Total sulphur	10.43%	IS: 1350 PartIII
Iron, as Fe	0.37%	AA – 18

Table No.06 Showing Results Of Particle Size.

Jarita Trivanga	5-6 microns
Trivanga Bhasma	4-5 microns

Table No.07 & 08. XRD Reports: Chemical composition of the samples after confirming the identification of d – identified with d – standard peak

Jarita Trivanga	d – standard	d - identified	XPDF No.	Name, Composition, Crystal structure
TIN	2.9166	2.9158	03-065-0296	Tin Sn Tetragonal
	2.7934	2.7922		
	2.0173	2.0157		
LEAD	2.8574	2.8534	03-065-2873	Lead Pb Cubic
	2.4746	2.3663		
	1.7498	1.7473		
ZINC	2.8141	2.8152	03-065-3411	Zinc oxide ZnO Hexagonal
	2.6034	2.6024		
	2.4757	2.4708		

Trivanga Bhasma	d – standard	d - identified	XPDF No.	Name, Composition, Crystal structure
TIN	3.3470	3.3586	00-041-1445	Stannous oxide SnO2 Tetragonal
	2.6427	2.6489		
	2.3690	2.3731		
LEAD	5.0220	5.0276	01-085-1289	Lead oxide PbO Tetragonal
	3.1165	3.1243		
	1.6755	1.6774		
ZINC	2.8141	2.8178	03-065-3411	Zinc oxide ZnO Hexagonal
	2.6034	2.6099		
	2.4757	2.4816		

NPST:

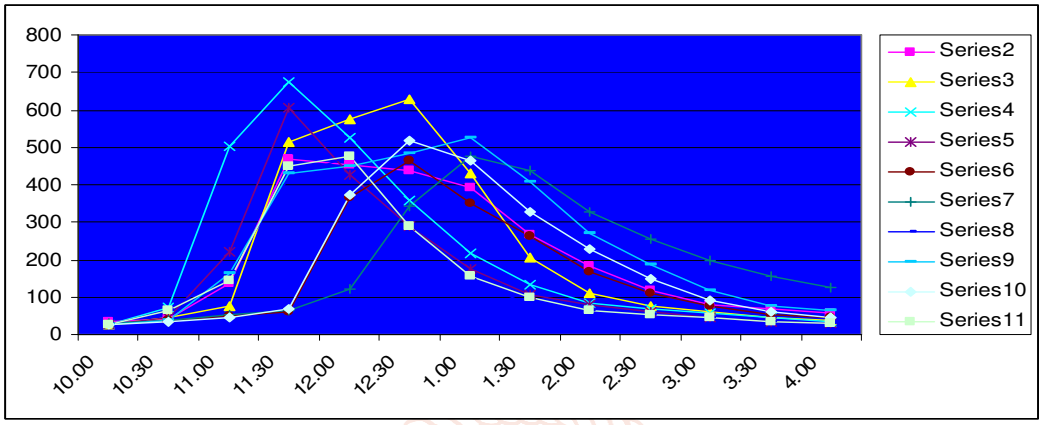
The sample of Trivanga bhasma showed the pattern of colour changes as follows.

First phase: Dark brown centered spot, change to Orange surrounded with glittering golden yellow periphery spreading outwards. Glittering colour turns yellow with brown margin. Between center orange and yellow periphery a silver ring appeared. Brown margin has centered with white ring and start fading

Second phase: The pattern and colour of the spot continues.

Third phase: A deep orange center with yellow circle, white margin with completely faded brown.

Graph Showing Comparison of Time & Temp of 10 Laghu putas



X- TIME Y- TEMP

DISCUSSION

Trivanga bhasma is an ancient classical rasa medicine containing three puti lohas. Even though rasa texts were mentioned Trivanga bhasma, literary review helps to infer that Rasachandamshu is the most ancient text to quote this preparation. These sequence of ingredients used is dissimilar in most of the texts. However in majority of them Vanga, Naga and Yashada is the order of sequence of these drugs. Three drugs starting from Vanga may be the criteria for naming it as **Trivanga**, but Charaka samhita, Susruta samhita and Astanga sangraha have used the name Trapu prior to Naga, hence in Trivanga Vanga, Naga and Yashada sequence seems to be more logical. Still the sequence doesn't show any significance in pharmaceutico therapeutic concern. Acharya Sharangadhara and Yogaratnakara have started from Naga but there is also a reference in the Rasa raja mahodadhi regarding Yashada as the first ingredient in Trivanga.

Trivanga bhasma is a mulika marita puta pakwa kalpa. Of course it can be prepared by Damaru yantra method also. Naga and Vanga were basically classified under Dhatu varga in general. In most of the Rasashastra and Ayurvedic texts, Naga, Vanga are particularly grouped as **Puti lohas**. The bad odor produced while heating them may be the reason for designating them as puti lohas. During the late 13th century in Madanapala nighantu and in early 14th century by Adhamalla the commentator of Sharangadhara samhita Yashada was introduced in Dhatu varga and currently Naga, Vanga and Yashada all the three in toto are regarded as puti lohas.

In various Rasa Granthas different types of liquid medias like Taila, Takra, Gomutra, Kulattha Qwatha, Kanji and Choornodaka are mentioned. Shodhana described before any kind of use of trivanga for marana. So the main purpose of shodhana of Trivanga seems to be far. Removal of both water soluble and fat soluble impurities. Destruction of structure of trivanga by converting to a granular form especially before marana. pH of these drugs do play an important role in the structural changes in Trivanga as well as impose their properties on it during the process.

In this study, Samanya and Vishesha shodhana of Naga, Vanga and Yashada was performed by the process of **Dhalana.** So, here the action of Dhalana procedure for samanya and vishesha shodhana of metals /minerals has been discussed.

Physical changes

Repetition of heating and cooling causes disruption in compression tension equilibrium leads to increased brittleness, reduction in hardness and finally reduction in the particle size. The size reduction during shodhana by Dhalana process may be explained by **Griffith theory;** according to this theory, all solids contain flaws and microscopic cracks. A flaw is any structural weakness that may develop into a crack under strain like heat. The weakest flaw in a particle determines its fracture strength. Usually the surfaces of particles are irregular. The applied force by the form of heat is initially taken on high portion of the surface. As a result, high stress may be set up locally in the

particles. The bond at this place becomes weak, which may be responsible for flaws. The particle with the weakest flaw fractures most easily and produced largest possible pieces. In the next step, another weakest flaw fractures. By this way particle size is reduced.

Chemical changes

During molten/red hot state of metals and minerals volatile chemical impurities like arsenic are removed completely. Some metals and minerals during molten or red hot state react with atmospheric oxygen or steam and form chemical compound. So during molten or red hot state immediate quenching in liquid media is important; it facilitates chemical reaction in the media whenever the materials remain molten or red hot. For example Tin when heated to molten, react with atmospheric oxygen or steam to form Tin oxide. Like this zinc and lead also forms there respective oxides.

The word Jarana doesn't find mention in context with puti lohas anywhere in the original verses. It can be said to be derived from the concept of Jarana of Gandhaka into Parada, which is a type of digestion. Going into those details is irrelevant in this context. In very recent texts of Rasashastra we find the mention of the word Jarana in context of Puti loha. But exactly where and how this term was coined remains as a question. Considering it to be convenient to us and indicating the digestion of one material into the another we pressure this term.

Jarana of Trivanga is done with Apamarga. This helps better absorption of these three drugs as the buffer of Na_2CO_3, helps reduce the dosage of Trivanga to be administered. The ability of this process to convert Trivanga into powder with high melting point proves that the material is not in the metallic form. This complexed material is the raw material for marana.

In this study, Marana of Trivanga Bhasma was done by Putapaka method. So in this phase of discussion, the ideology of Putapaka procedure of Marana has been discussed.

Putapaka process:

In this process the Shodhita material is mixed with Marana drug and is levigated by particular media. After levigation, Chakrikas are prepared and kept in two earthen saucers; junction is sealed by mud smeared clothes. After complete dryness this Sharava Samputa is subjected to Puta for heating. These processes are repeated for specific times. So Putapaka process is performed in following phases.

In the procedure of Marana, physical characters of the material are changed by three processes, during mixing, during levigation and during incineration. During mixing, the particle size of the material is reduced by dry grinding method. Here surface phenomena plays the role, and breaking down of the material takes place by rubbing action, called as **attrition**.

During levigation (Bhavana), the physical form of the material is changed when stress in the form of attrition is applied. In this process liquid media is used so it may be called wet grinding and it is observed that finer particles are achieved by wet grinding process than dry grinding process. During incineration (Putapaka), final change in the physical form of the material takes pace. Chemical reaction occurs during Shodhana in some metals like Trivanga. Generally the compound is formed on the surface of the metal. Heating during incineration causes linear expansion of both the metal and the compound. But the expansion of metal and compound are different. And this difference in the linear expansion leads to separation of the compound from the metal, causing exposure of the metallic part, facilitates further change. Repetition of this process leads to reduction in particle size and fineness of the particles. The inorganic contents of drug for levigation (Bhavana Dravya) supplement to the metallic compounds in the final product and act as trace elements, which are favorable to the body.

Chemical changes:

After Marana the metals generally convert to their compound form, which are biologically favorable to the body. And it is mandatory that all the metals must be transformed to complete metallic compound after the process of Marana.

Thermodynamics of Puta:

Flow of heat:

Heat flow in Puta can be explained by the **mechanism of conduction**. Heat can be conducted only when there is a temperature gradient, i.e. heat flows from a hot surface to a cold surface. In case of *Putapaka* process heat is applied to the Sharava Samputa from all side, and there is a clear temperature gradient between the outer part and inner part of Sharava Samputa. Here heat flows in the Sharava Samputa by the mechanism of conduction. Conduction of heat through *Chakrika* (pellets) can be interpreted by **Fourier's law.** According to this law, **the rate of heat flow through a uniform material is proportional to the area and the temperature drop and inversely proportional to the length of the path of flow.** So the pellets must be flat in shape rather than spherical mass, and thickness of pellets must be as less as possible facilitates easy flow of heat, but in a spherical pellet, there will be a temperature difference between the surface and the

core. Area of a flat pellet is also more than spherical pellet of same weight, so it may facilitates more flow of heat to the pellet.

The Fourier s law may be mathematically expressed as:
Area (m2) x temperature difference (K)
Rate of heat flow α
Thickness (m)

Heat exchange:
The exchange of heat from the Puta to the material inside Sharava Samputa can be explained by **Hess's law of thermodynamics**. According to this law **the amount of heat evolved or absorbed in a chemical change is the same whether the process takes place in one or several steps.** In Putapaka chemical changes take place to the material and the material is changed to compound form. The energy required for the chemical change is same to the energy of heat absorbed by the material in the Sharava Samputa during Putapaka. Specific type of Puta for particular material can be explained by this law; lesser grade of Puta is indicated for easily fusible material, because for their chemical changes less heat is required. And greater type of Puta is indicated for tougher and harder material, because for their chemical changes more heat is required.

Analysis of the drug is necessary to know the Physico – chemical, macro and micro properties and to confirm the safety and efficacy of the drug. To ensure, the essential components, which are present within a predetermined range of composition, Physico – chemical analysis is necessary.

The total ash value of the used drugs of Trivanga bhasma were within pharmacopoeial standard limits indicating the good quality of raw drugs. Total ash value of Trivanga bhasma was 99.25%. Showing that the prepared Trivanga bhasma contained permissible amount of inorganic material, devoid of unwanted materials and contamination proving the standard and safety of Trivanga bhasma.

The Trivanga bhasma was evaluated for loss on ignition at 500^0C and it was found to be having 0.75%, indicates Trivanga bhasma is a tharmostable compound, which is in standard limit.

Trivanga bhasma is having pH of 10.10. This value indicates the alkalinity. Is a weak base having less pKa value hence more absorbable.

The X- Ray diffraction shows that the d – identified peaks of both the samples are on par with there respective d – standard peaks the samples are confirmed for the presence of tin, lead and zinc chemical composition. In Jarita Trivanga tin and lead are in metallic and in powder form and zinc is converted into zinc oxide. In Trivanga bhasma zinc, tin and lead are completely converted into their oxide forms. In Jarita Trivanga, crystal structure of Tin-Tetragonal, Lead-Cubic and Zinc oxide-Hexagonal and in Trivanga Bhasma Tin oxide- Tetragonal, Lead oxide- Tetragonal and Zinc oxide- Hexagonal.

The Namboori Phased Spot Test was carried out with an intention to find the chromatographic standards for Trivanga bhasma. This technique estimates qualitative standardization of Trivanga bhasma. It was observed that the pattern of colour change was almost same. The series of changes in the colour is due to reaction between potassium iodide paper and solution prepared out of Trivanga bhasma and 5N HNO_3.

CONCLUSION

The classical combination of three metals starting with Vanga followed by Naga and Yashada has attributed the name '**Trivanga'** to it. All the three metals produce putrid smell on heating hence are categorized as **Puti lohas**.

To obtain good quality Trivanga Bhasma 10 **Laghu Putas** with an average **temperature** of 475^0 C – 575^0 C is required. By the end of 10^{th} Puta all **Bhasma Pareeksha's** were found positive in Trivanga Bhasma. The XRD report of Trivanga Bhasma revels that it is complex of three compounds Viz. **SnO_2, PbO, ZnO**.

Trivanga Bhasma is a Novel poly-crystalline complex molecule but not a mere combination of Naga Bhasma, Vanga Bhasma and Yashada Bhasma.

REFRENCES

[1] Shankara, Rasachandamshu, edited by Dattarama vaidya translated in kannada by Dr.A.Halseekar, Atreya sadana,1850,Ganesh pet, Hubli, Purvakhanda, 568 shloka, 139pp.
[2] Sadananda Sharma, Rasa Tarangini, edited by Kasinatha Shastri, 11^{th} edn, Varanasi, Motilal Banarasi Das, 1979, 19^{th} Taranga, 10^{th} Shloka, 458pp.
[3] Sadananda Sharma, Rasa Tarangini, edited by Kasinatha Shastri, 11^{th} edn, Varanasi, Motilal Banarasi Das, 1979, 18th Taranga, 8-9th Shloka, 437pp.
[4] Sadananda Sharma, Rasa Tarangini, edited by Kasinatha Shastri, 11^{th} edn, Varanasi, Motilal Banarasi Das, 1979, 19^{th} Taranga, 98-99^{th} Shloka, 475pp.
[5] Shankara, Rasachandamshu, edited by Dattarama vaidya translated in kannada by Dr. A. Halseekar, Atreya sadana, 1850, Ganesh pet, Hubli, Uttarakhanda, 277-228 shloka, 487-488pp.

PHOTOS

SAM.SHODHANA

JARANA

SAMPUTA

I PUTA

X PUTA

NPST

APUNARBHAVA PAREEKSHA

REKHAPURNAT

VAVARITARA

UNNAMA